

CLAIMS

What is claimed is:

1. 1. A method comprising:
forming a porous interlayer dielectric;
etching a via and a trench in the porous interlayer dielectric;
exposing the dielectric to a sealant chain having at least silicon, carbon, oxygen, and hydrogen, wherein the sealant chain reacts with a second chain, that has at least oxygen and is present in the interlayer dielectric defining the pores, to form a continuous layer over the surface of the interlayer dielectric.
2. The method of claim 1, wherein the interlayer dielectric is an oxide.
3. The method of claim 2, wherein the sealant chain comprises an alkoxysilane.
4. The method of claim 2, wherein the second chain contains at least Si-OH.
5. The method of claim 1, wherein the interlayer dielectric is a polymer.
6. The method of claim 5, wherein the sealant chain comprises an alkoxyvinylsilane.

7. The method of claim 5, wherein the second chain contains at least C-OH.
8. The method of claim 5, wherein the second chain contains at least C=O.
9. The method of claim 1, wherein the continuous layer comprises SiO₂.
10. The method of claim 1, wherein the sealant chain uses an oligomeric structure.
11. A method comprising:
 - etching a via and a trench in a dielectric, wherein the dielectric has a plurality of pores;
 - treating the surface of the dielectric with a silane coupling reagent to seal the pores exposed on the surface of the dielectric; and
 - forming a conductive layer on the surface of the dielectric.
12. The method of claim 11, wherein the dielectric is an oxide.
13. The method of claim 12, wherein the silane coupling reagent comprises an alkoxysilane

14. The method of claim 13, wherein the alkoxysilane is methoxypropyltrimethoxysilane.
15. The method of claim 11, wherein the dielectric is a polymer.
16. The method of claim 15, wherein the silane coupling reagent comprises an alkoxyvinylsilane.
17. The method of claim 16, wherein the alkoxyvinylsilane is vinyltriethoxysilane.
18. The method of claim 11, wherein the silane coupling reagent comprises an oligomeric structure.
19. The method of claim 18, wherein the oligomeric structure is a dimer.
20. The method of claim 18, wherein the oligomeric structure is designed to fill a pore with one atom.
21. The method of claim 11, wherein treating comprises bubble vapor deposition of the silane coupling reagent.

22. The method of claim 21, wherein the bubble-vapor deposition carrier gas comprises Nitrogen (N₂).

23. The method of claim 21, wherein the bubble-vapor deposition carrier gas comprises Argon.

24. The method of claim 11, wherein treating comprises spin-coating the silane coupling reagent onto the dielectric.

25. A method comprising:

forming a dielectric; and

exposing the surface of the dielectric to a silane coupling reagent, wherein the silane coupling reagent reacts with the dielectric to form a continuous film over the dielectric.

26. The method of claim 25, wherein the dielectric comprises an oxide.

27. The method of claim 26, wherein the silane coupling reagent comprises a trialkoxysilane.

28. The method of claim 25, wherein the dielectric is a polymer.

29. The method of claim 28, wherein the silane coupling reagent comprises trialkoxyvinylsilane.
30. The method of claim 29, further comprising: exposing the dielectric to an oxidant to prepare the surface of the dielectric.
31. The method of claim 30, wherein the oxidant comprises peroxide.
32. The method of claim 25, wherein the silane coupling reagent comprises an oligomeric structure.
33. The method of claim 25, wherein the continuous film comprises an SiO_2 film covalently linked to the porous dielectric.
34. The method of claim 25, wherein a plurality of Si-OCH_3 groups condense on the porous dielectric.
35. An interconnect structure comprising:
- a via and a trench defined by an interlayer dielectric;
 - a continuous silicon dioxide layer covalently linked to the interlayer dielectric; and

a conductive layer disposed on the continuous silicon dioxide layer.

36. The interconnect structure of claim 35, wherein the interlayer dielectric is an oxide.

37. The interconnect structure of claim 35, wherein the interlayer dielectric is a polymer.

38. The interconnect structure of claim 35, further comprising condensed Si-OCH₃ groups on the interlayer dielectric.

39. The interconnect structure of claim 35, wherein the conductive layer is a barrier layer.

40. The interconnect structure of claim 35, wherein the conductive layer comprises tantalum.

41. The interconnect structure of claim 40, wherein the barrier layer comprises tantalum-nitride.